Predictive Uncertainty

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Predictive Uncertainty

- Reasons to conduct analysis
  - Requested by current and former Directors
  - Requested by Hearing Officer
  - John Koreny and Allan believe predictive uncertainty analysis can be used to identify strengths and weaknesses in model
    - Weaknesses can be spatial, tied to a specific parameter(s), conceptual, etc
    - Once weaknesses are identified, they can be addressed
  - Greg and Allan believe analysis can be used to describe uncertainty in model predictions

Predictive Uncertainty

- The ESHMC chose an approach to evaluate predictive uncertainty that they felt could be completed given our time and budget
- The ESHMC does not unanimously support conducting a predictive uncertainty analysis

Factors Affecting Predictive Uncertainty

- Conceptual uncertainty
  - Uncertainty in our attempt to numerically portray the physical system
  - Not addressed
- Parameter uncertainty (water budget uncertainty)
  - Dr Brendecke defines this as uncertainty in water budget components such as tributary underflow, irrigation diversions, perched river seepage, etc
  - Is addressed through scalars for many components of the water budget
  - Uncertainty in trends in water budget components is not addressed
- Internal calibration uncertainty
  - How tightly field observations constrain model physical properties
  - Is addressed
- Exterior calibration uncertainty
  - Field observations have uncertainty and necessarily contribute to predictive uncertainty
  - Can be addressed to some extent by giving more uncertain observations lower weights
  - We are not addressing our weighting scheme

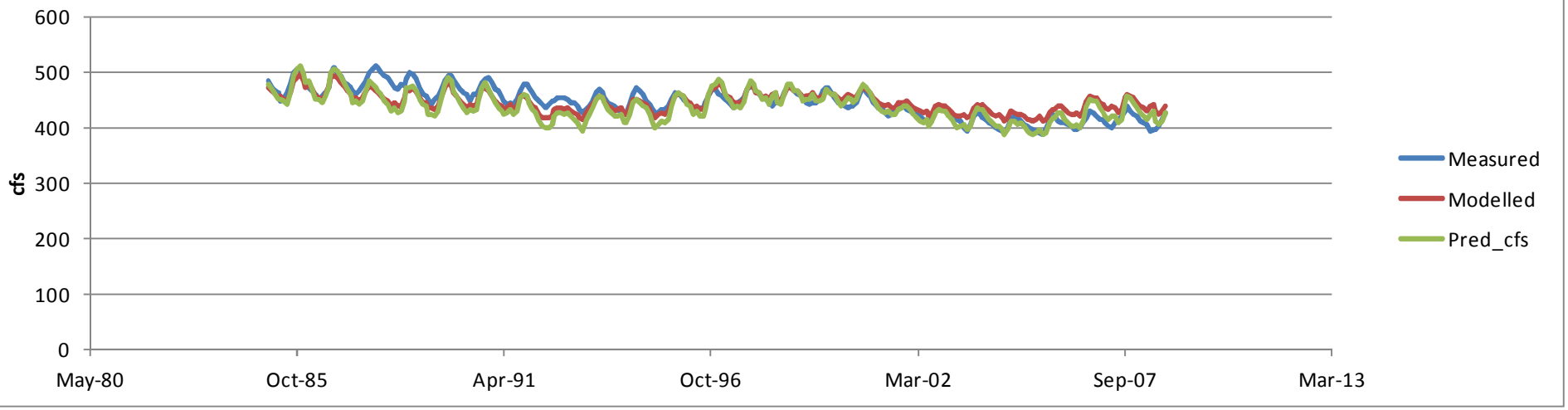
Spatial variability

- Predictive uncertainty is not one number, it is dependent on the prediction
  - Location of stress applied and reach where stress is observed
  - We are evaluating impact of stress at eight 3x3 blocks on four reaches
    - Blocks are located near the centroid of Water Districts 100, 110, 120, 130, 140, 34, 33, and Rexburg Bench
    - Reaches where we are evaluating the stress are Clear Lakes, Blue Lakes, nr Blackfoot-Minidoka, and Henry's Fork
    - Have completed
      - WD130 – Clear Lakes
      - WD120 – Clear Lakes
      - WD110 – Clear Lakes

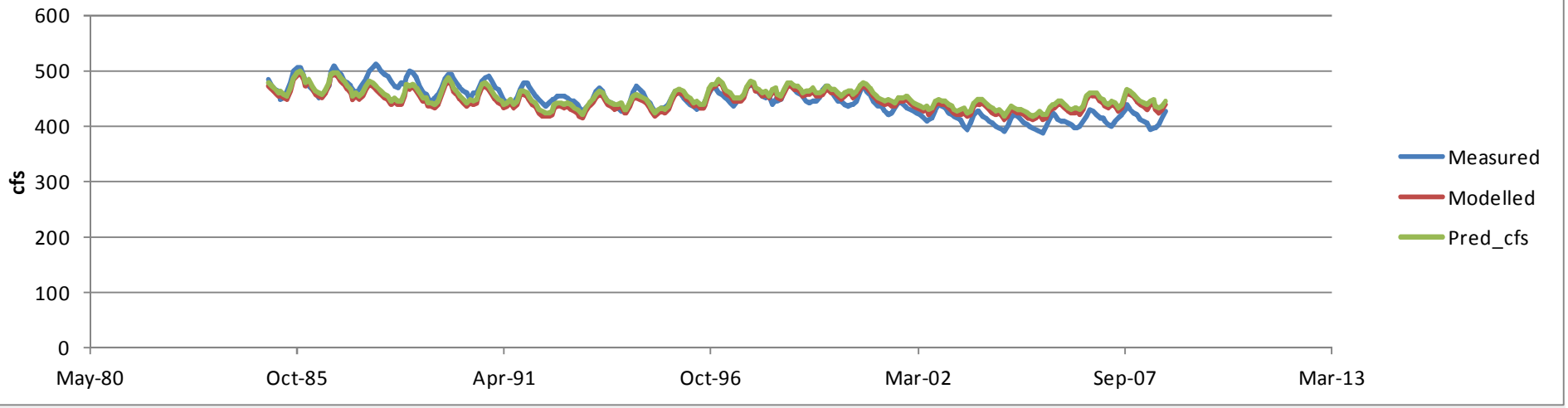
Method

- Run model once in calibration mode and collect model outputs and compare them with field observations
- Run model again with prediction injecting fixed amount of water in 3x3 block within one of the selected ESPA Water Districts
  - Water Districts 100, 110, 120, 130, 140, 33, 34, and Rexburg Bench
- Evaluate impact of water injection at one of the four selected reaches
  - Clear Lakes, Blue Lakes, nr Blackfoot – Minidoka, and Henry's Fork
- Repeat numerous times while adjusting model parameters to locate maximum and minimum impact from 3x3 block at selected reach without adversely impacting overall model calibration

Maximize CLEARLK



Minimize CLEARLK



Limitations

- It appears that there are varying opinions on what the analysis can be used for and the value of the analysis.
  - Allan believe it is a powerful tool to identify the strengths and weaknesses of the model. Once weaknesses are identified, strategies can be developed to minimize the weaknesses
  - John Koreny thinks once calibration is done the model is ready for use and the values that come out of an uncertainty analysis should not be used to constrain the predictive analysis of the model by applying some kind of “uncertainty factor”
  - Greg thinks the Director should be informed as to the scope and limitations of the proposed uncertainty analysis so that he can judge whether the analysis will conform with his expectations and with the way that he may use the results